



Upstream Oil & Gas Reclamation & Remediation Program

Assessing Drilling Waste Disposal Areas

April 2004
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Drilling waste disposal information must be provided with each Reclamation Certificate application

As part of the Upstream Oil and Gas Reclamation and Remediation Program, Alberta Environment requires documentation showing compliance with or equivalent environmental results to the Alberta Energy and Utilities Board's *Guide 50 - Drilling Waste Management* as part of a Reclamation Certificate application.

In consultation with stakeholders, Alberta Environment has developed three options for compliance with these requirements.

Two of the options (Option 1 and 2) exempt drilling waste disposal areas from a Phase 2 environmental site assessment (ESA). If neither of these options applies at a particular site, a Phase 2 ESA (Option 3) must be conducted in the drilling waste disposal area.

COMPLIANCE OPTION ONE
Submission of the *Drilling Waste Notification Form* required by *Guide 50* with the Reclamation Certificate application. The form must show that all *Guide 50* requirements were met.

COMPLIANCE OPTION TWO
Submission of Daily Drilling Reports confirming that the following criteria have been met:

- ☐ Well depth less than 700 metres
- ☐ Well location is west of the 4th meridian and east of the 5th meridian
- ☐ Freshwater gel-chem drilling fluid used that meets the criteria for salt load (see Freshwater Gel-Chem Salt Load Criteria)
- ☐ Drilling records do not indicate conditions likely to result in non-compliance with *Guide 50*

Freshwater Gel-Chem Salt Load Criteria
For the purposes of this compliance option, freshwater gel-chem drilling fluids must be water-based fluids containing no more than 0.06 sacks (25 kg per sack) of salt additives per metre of drilling depth.

Salt or salt generating additives are:

- ☐ **Sodium Salts:** Soda Ash (Na_2CO_3), Caustic Soda (NaOH), Sodium Bicarbonate, Sodium Chloride, Sodium Silicate

- ☐ **Calcium Salts:** Calcium Chloride, Gypsum, Calcium Nitrate, Envirofloc, Lime (CaOH)
Note: Up to 0.02 sacks of gypsum and lime per metre of well depth should be counted with other salt additives. Sacks of gypsum and lime in excess of this value need not be counted.
- ☐ **Potassium Salts:** Potash (KCl), Caustic Potash (KOH), Potassium Sulphate, Potassium Formate, Potassium Silicate, Potassium Nitrate
- ☐ **Nitrogen Salts:** Diammonium phosphate, Ammonium Nitrate, Ammonium Sulphate,

Freshwater gel-chem drilling fluids should not contain petroleum hydrocarbon, barium, chromium, copper, lead, nickel, or zinc-based additives.

Alternatively, the number of sacks per metre of drilling depth can be varied by salt type, as described below ("Calculating Salt-Specific Salt Load Criteria").

Calculating Salt-Specific Salt Load Criteria
Different types of salt additives vary in their contribution to total waste salinity. Different additives can be normalized by calculating the amount of sodium hydroxide that would contribute the same amount of salinity.

To calculate the total salt load, convert the quantity of each salt additive to a sodium hydroxide equivalent and then sum the equivalents.

The following procedure must be followed when using this approach:

1. Sum the number of sacks for each salt additive separately. Sacks are assumed to weigh 25 kg. If larger or smaller sacks were used, the number of sacks should be adjusted accordingly.
2. For each type of salt, multiply the number of sacks by the NaOH Equivalency Factor in the following table. The result is the number of NaOH Equivalent Sacks for that salt additive.
3. Calculate the number of Total NaOH Equivalent Sacks by summing the number of NaOH Equivalent Sacks for all the additives. The number Total NaOH Equivalent Sacks must not exceed 0.035 sacks (25 kg per sack) per metre of well depth.

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NaOH Equivalency Factors

Salt	NaOH Equivalency Factor
Caustic Soda	1.00
Soda Ash	0.75
Sodium Chloride	0.68
Sodium Bicarbonate	0.95
Sodium Silicate	1.37
Calcium Chloride	0.72
Gypsum*	0.59
Calcium Nitrate	0.34
Envirofloc	0.41
Lime*	1.08
Potassium chloride	0.54
Potassium sulphate	0.46
Caustic potash	0.71
Potassium formate	0.47
Potassium silicate	0.32
Potassium nitrate	0.40
Diammonium phosphate	0.63
Ammonium nitrate	0.57
Ammonium sulphate	0.61

Analytical methods must comply with **Guide 50: Drilling Wastes Management**

COMPLIANCE OPTION THREE

If the drilling waste notification form or daily drilling reports are not available, are incomplete or illegible, or indicate non-compliance with *Guide 50*, a Phase 2 Environmental Site Assessment (ESA) must be conducted in the drilling waste disposal area.

PHASE 2 ENVIRONMENTAL SITE ASSESSMENTS

Soil samples must be taken from the drilling waste disposal area within the zone of soil/waste mixing. The samples must be analyzed for petroleum hydrocarbons, the trace elements specified in *Guide 50* plus barium, electrical conductivity (EC) and sodium adsorption ratio (SAR). Analytical results must meet the guidelines specified below.

Salinity Guidelines

Guide 50 Equivalent Salinity Guidelines in the following table may be used as an alternative to the Alberta Environment *Salt Contamination Assessment and Remediation Guideline*.

Guide 50 Equivalent Salinity Guidelines

Topsoil	EC of 2 dS/m, SAR of 6
Below topsoil to 1 metre	EC of 3 dS/m, SAR of 8
Below 1 metre	EC of 6 dS/m, SAR of 10

Use of the *Guide 50 Equivalent Salinity Guidelines* is contingent on compliance with other *Guide 50* requirements.

In particular, for the mix-bury-cover disposal method, *Guide 50* (section 3.1) states:

- ☐ The base of the soil-waste mix must be at least 1 meter above a water table and 1 meter above a layer of permeable material
- ☐ A minimum of 1 meter of clean fill must be placed over the soil-waste mix before topsoil is replaced

Equivalent salinity guidelines for topsoil must not be exceeded. Below topsoil, if receiving soil exceeds these guidelines because of naturally occurring salt, an increase of 1 unit above pre-disposal receiving soil background will be accepted for both EC and SAR.

Alternatively, sites will be accepted if they meet the Alberta Environment *Salt Contamination Assessment and Remediation Guidelines*.

Hydrocarbon Guidelines

Petroleum hydrocarbon concentrations must comply with the *Alberta Soil and Water Quality Guidelines for Hydrocarbons at Upstream Oil and Gas Facilities*.

File information confirming that mineral oil and grease concentrations were less than 0.1% will be accepted in lieu of current site assessment data for hydrocarbons.



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Trace Element Guidelines

Concentrations of trace elements including cadmium, chromium, copper, lead, nickel, vanadium and zinc must comply with the *Canadian Environmental Quality Guidelines* (1999 as updated) for agricultural land use.

Barium concentrations must comply with the *Alberta Soil Quality Guidelines for Barite*.

For boron and other substances, refer to the *Alberta Tier I Criteria for Contaminated Soil Assessment and Remediation*.

Analytical Methods

The analytical methods used to measure EC, SAR, and trace elements must be consistent with Appendix 3 of *Guide 50*.

Analysis of petroleum hydrocarbons must comply with the *Reference Method for the Canada Wide Standard for Petroleum Hydrocarbons in Soil - Tier I Method*.

Sampling Requirements

For land spreading and land treatment, a minimum of one composite sample (5 subsamples) is required from the soil/waste mixing zone for each 2500 m².

For mix-bury-cover, a minimum of one composite sample (5 subsamples) from the soil/waste mixing zone is required per 400 m² of mix-bury-cover surface area.

At older sites where the disposal method is unknown or of a different type, a comparable sampling program is required.

The sampling densities specified are minimum requirements. Where conditions indicate unusually high variability, assessors should increase sampling density accordingly.

ONGOING COMMITMENT

Alberta Environment is committed to working with the Energy and Utilities Board and industry to ensure that guidance for drilling waste management and environmental endpoints are harmonized and drilling waste disposal areas pose no risk to the environment.

CONTACTS

The following can be reached toll free by dialing 310-0000 and then dialing the number shown below.

For public lands:

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For all other lands:

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